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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/817,417	03/30/2004	Hongyu Yue	071469-0307692	1294

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PILLSBURY WINTHROP SHAW PITTMAN, LLP
P.O. BOX 10500
MCLEAN, VA 22102

EXAMINER

CHEN, KIN CHAN

ART UNIT	PAPER NUMBER
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1765

DATE MAILED: 06/20/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/817,417

Applicant(s)

YUE ET AL

Examiner

Kin-Chan Chen

Art Unit

1765

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 May 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-6 and 8-10 is/are pending in the application.
- 4a) Of the above claim(s) 10 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6, 8 and 9 is/are rejected.
- 7) ☒ Claim(s) 8 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicant's election with traverse of claims 1-6, 8, and 9, cancellation of claims 7 and 11, and withdrawal of claim 10 are acknowledged. The traversal is on the ground(s) that claim 10 (group II) sufficiently overlaps the search and examination of the subject matter of group I (claims 1-6, 8, and 9). This is not found persuasive because the apparatus as claimed can be used to practice another and materially different process such as plasma deposition or vapor deposition process. Besides, the method of group I and the apparatus of the group II are under different classifications and involve different search (e.g., applicant may amend the apparatus claims by adding various apparatus features and limitations during the prosecution) that would be a serious burden on the examiner. The requirement is still deemed proper and is therefore made FINAL. A complete reply to the following rejection must include cancellation of nonelected claims or other appropriate action.

Claim Objections

2. Claim 8 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of claim 1. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 8 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 8, "determining includes fitting a first derivative of said trim amount data as said function of time with an exponential relationship" is conflicting with claim 1 of a log relationship. Therefore, claim 8 is vague and indefinite.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1-6, 8, and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tomoyasu et al. (US 2004/0185583) as evidenced by Wadsworth (Handbook of statistical methods for engineers and scientists).

In a method for removing chemical oxide on a substrate, Tomoyasu teaches that trim amount data as a function of time for a process recipe may be acquired. A relationship between a value related to the trim amount data and time may be determined. The target trim amount and the relationship may be used to determine a target trim time for achieving the target trim amount. The feature on the substrate may be chemically treated using the process recipe for the target trim time. The target trim amount may be substantially removed from the feature. Tomoyasu also teaches thermally treating the substrate and rinsing the substrate following the chemical treating. Tomoyasu teaches varying flow rates of HF, NH₃, and argon. Tomoyasu also teaches varying pressure, and temperature. Tomoyasu teaches treating a silicon oxide feature. See abstract; [0007], [0059]-[0064], [0074], [0200].

Tomoyasu teaches trim amount data as a function of time. Tomoyasu teaches SPC charts, and various statistics models and tools may be used, see [0074]. Hence, after completing data collections in various process conditions, it would have been obvious to one with ordinary skill in the art to apply commonly used engineering calculation, curve fitting techniques and statistical tools to determine and curve fit the relationship between trim time and trim amount. As such, log relationship (e.g., claims 1 and 9), or exponential relationship (e.g., claim 8) would have been expected in some results when using various process conditions. See also statistical tool of non-linear regression in Wadsworth (Handbook of statistical methods for engineers and scientists) as evidence. Wadsworth shows the way to curve fit experimental data in log relationship or exponential relationship.

6. Claims 1, 4-6, 8, and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Natzle et al. (US 2004/0097047) as evidenced by Wadsworth (Handbook of statistical methods for engineers and scientists).

In a method for removing chemical oxide on a substrate, Natzle teaches that a chemical oxide removal process may be performed using a process recipe including a first reactant and a second reactant. **Natzle [0042] teaches acquiring trim amount data as a function of variable parameters (such as, time, temperature, composition, residence time, pressure of the reactant, the amount of reactant or the rate of reactant), all of which can be regulated.** Natzle [0042] also discloses that the aforementioned variable parameters influence the amount removed. Therefore, it would have been obvious to one with ordinary skill in the art that trim amount data as a function of time for a process recipe may be acquired. A relationship between a value related to the trim amount data and time may be determined. The target trim amount and the relationship may be used to determine a target trim time for achieving the target trim amount. Natzle teaches that the feature on the substrate may be chemically treated using the process recipe for the target trim time. The target trim amount may be substantially removed from the feature. Natzle teaches varying flow rates of HF, NH₃, pressure, and temperature. See [0014] [0037] [0038] [0042]-[0044].

As to dependent claim 6, Natzle teaches treating a silicon oxide feature, see [0014].

After gathering information of etching rates, thickness (trim amount) as function of time, process parameters) in various process conditions, it would have been obvious to one

with ordinary skill in the art to tabulate / extrapolate / manipulate data and perform calculation using common engineering and statistical methods (such as regression, extrapolation, best-fit, polynomial, least squares, interpolation). As such, log relationship (e.g., claims 1 and 9), or exponential relationship (e.g., claim 8) would have been expected in some results when using various process conditions. See also statistical tool of non-linear regression in Wadsworth (Handbook of statistical methods for engineers and scientists) as evidence. Wadsworth shows the way to curve fit experimental data in log relationship or exponential relationship.

Claim 5 differs from Natzle by specifying well-known features (such as adding inert gas of argon to the etchant as a process gas and determining the effect on the etching) to the art of semiconductor device fabrication, the examiner takes official notice. It is the examiner's position that a person having ordinary skill in the art at the time of the claimed invention would have found it obvious to incorporate inert gas to same in order to provide their art recognized advantages and produce an expected result with a reasonable expectation of success.

7. It is noted that applicant did not traverse the aforementioned conventionality (e.g., well-known features and common knowledge), which have been stated in the previous office action (January 10, 2006).

8. Claims 2 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Natzle as applied to claim 1 above, and further in view of Doris et al. (US 2004/0241981; hereinafter "Doris").

The discussion of modified Natzle from above is repeated here.

Natzle is silent about the heating and rinsing with water after the chemical treating. In a method for chemical oxide removing, Doris teaches heating and rinsing with water after the chemical treating so as to efficiently remove the solid reaction product, see [0046]. Hence, it would have been obvious to one with ordinary skill in the art to modify Natzle by heating and rinsing with water as taught by Doris in order to efficiently remove the solid reaction product.

Response to Arguments

9. Applicant's arguments filed May 10, 2006 have been fully considered but they are not persuasive.

Applicant has argued that there is no motivation or suggestion to apply commonly used curve fitting techniques and statistical tools to determine the relationship between trim time and trim amount. It is not persuasive. The examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Performing engineering calculation such as curve fitting techniques and statistical tools is the knowledge generally available to

one of ordinary skill in the art (basic course requirement for undergraduate engineering). See example of Wadsworth (Handbook of statistical methods for engineers and scientists, chapter 18, 18.1-18.5) which shows the way to curve fit experimental data in log relationship or exponential relationship.

Conclusion

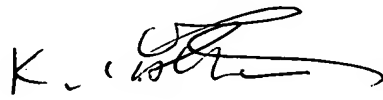
10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Wadsworth (Handbook of statistical methods for engineers and scientists, chapter 18, 18.1-18.5) which shows some examples of curve fit experimental data in log relationship or exponential relationship.

11. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kin-Chan Chen whose telephone number is (571) 272-1461. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

June 15, 2006


Kin-Chan Chen
Primary Examiner
Art Unit 1765